



Disrupting path dependency: Making room for Indigenous knowledge in river management

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ABSTRACT

Scholars frequently identify how path dependency serves to constrain the process of climate adaptation and is a key feature of maladaptation. Most studies, however, centre on theoretical, rather than empirical-based discussions of what path dependency is, how it occurs, and what factors assist in breaking path dependency. This paper provides a case study for the creation, maintenance, and attempts to break path dependency within the management of rivers in the Rangitāiki Plains of Aotearoa New Zealand from the 1890s until 2017. We deploy a historical institutionalist theorising on path dependency and institutional arrangements, while also incorporating ideas from indigenous and postcolonial scholarship, which extends current understandings of the factors that contribute towards path dependency at a local level. Through archival research, we demonstrate how successive generations of government policies and actions directed with a specific goal and underpinned by the hegemonic social values created a profoundly path dependent system of managing rivers and flood events. Increased flood vulnerability is one of the direct consequences of the plethora of freshwater engineering interventions which were (and are still) undertaken on the Rangitāiki Plains over the last century. The foundation of this path dependency, we argue, resides with the processes of indigenous dispossession and the marginalisation of Māori values from environmental governance and policy. Efforts to break path dependency, therefore, involve the formal recognition of Māori governance, values, and knowledge within policies, and the translation of Māori values into tangible actions that seek to destabilise Western command-and control approaches to flood risk management.

1. Introduction

The impacts of climate change and the intensification of development on floodplains increase the risks posed by flood and heightens the importance of understanding both the causes of, and mechanisms for breaking path dependency. Despite incremental changes in policy in many countries over the last two decades, decision-makers remain largely “locked-in” to past policies and actions that favour engineered approaches to flood risk (Lawrence et al., 2015, 2013). This path dependency, we argue, is constraining future efforts to address changing flood risks linked to climate change (van Buuren et al., 2016). To make better-informed decisions about flood risks both now and in the future, it is critical that scholars and practitioners deepen their appreciation of past flood events, and understand how individuals and institutions respond to these events as well as the factors that influence institutional arrangements to manage environmental risks.

The concept of path dependence or path dependency is widely used

by climate scholars, particularly with regards to discussions of maladaptation (Barnett et al., 2015, p. 201); however, there is limited explanation of what the concept actually means in the context of environmental policy and climate change adaptation. Indeed, mention of path dependence typically includes vague references to past decisions or “history matters” (Sorensen, 2015), yet historians and social scientists acknowledge that the statement “history matters” is an unhelpful and uncritical truism with no explanatory power (van Buuren et al., 2016; van Staveren and van Tatenhove, 2016). The concept of path dependency is, however, useful when used to explore and explain the production of policies or paths (be it governance arrangements, modes of living, economic conditions, or in this instance flood risk management) that are difficult to change or exit, for a variety of reasons, as well as what factors maintain stability within pathways (Wise et al., 2014). Within the existing scholarship, emphasis is given to identifying the economic and technological “lock-in” factors within institutions, with a focus on the macro-level and national scale (Wiering et al., 2017a).

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Scholars, however, have devoted far less attention to examining the socio-cultural factors that contribute towards path dependence, particularly at local levels, and how policies, knowledge, strategies, and power relations are re-articulated within institutions in managing climate risks over the short and medium-term.

This paper contributes to the small but growing scholarship that draws on historical methodologies and sources to explore climate variability, vulnerability, and adaptation in past societies as a means to expand understandings of the process of adapting to climate change (Adamson, 2014; Adamson et al., 2018; Brännlund and Axelsson, 2011; Cameron, 2012; Carey, 2005; Carey et al., 2012; Cook, 2017; Jeffers, 2014; Romero Lankao, 2010). Recently, Jeffers (2014), whose work uses newspaper archives to analyse the history of flood events in three Irish coastal cities, called for “further historical research based on ... archival and unwritten sources” (Jeffers, 2014, p. 230). Our paper responds to this call by providing an archival study of the history of flood management in a predominately rural area in Aotearoa New Zealand (Aotearoa NZ). We assert that such in-depth empirical historical studies can offer significant insights into decision-making pathways within institutions, which can assist in identifying both the factors that contribute to, and help overcome path dependency, in the context of both flood risk management and climate adaptation. Indeed, Adamson et al. (2018) recently suggest that such a focus on the evolution of institutional arrangements can illuminate how historical events, decisions, and strategies inform and constrain present-day practices. Such analyses reveal how the interests of certain groups influence policies over time, how this ties to authority over and access to resources, and draws attention to issues of differential vulnerability and equity in policies and practices. By tracing the operations of different institutions historically in regards to specific climatic hazards, with close attention to local settings, scholars can explore the establishment and stability of inequitable and potentially maladaptive pathways. This can assist in identifying climate-related vulnerabilities, pinpoint winners and losers, and reveal failures and successes as a result of particular decisions.

In this paper, we provide a historical account of the creation of path dependency within a single flood risk management regime in the Rangitāiki Plains in Aotearoa NZ from the 1900s until the present day (2017). Flood events are the most frequent natural hazard experienced in Aotearoa NZ, and it is likely to continue to dominate the hazard-scape in the future given the majority of the population lives in locations vulnerable to flooding (Hopkins et al., 2015; Lawrence et al., 2015). We examine how social values and shared narratives led generations of Pākehā residents and decision-makers to perceive the freshwater and terrestrial ecosystems of the Rangitāiki wetlands as requiring radical re-organisation (transformation), and the close linkages between this transformation, the development of path-dependent institutions, and the marginalisation of local Māori communities’ knowledge and values. Parsons and Nalau (2016) previously observe how British colonisation underpinned the ecological transformations of the Rangitāiki Plains from wetlands to grasslands, and produced a host of negative outcomes for Māori iwi (tribes) including land loss and socio-economic deprivation, as well as interlinked freshwater degradation and declines in biodiversity. Following on from this study, we explore another of the unintended consequences of radical changes to the freshwater system – increased vulnerability of flooding – and demonstrate how path dependency within flood management in the Rangitāiki Plains emerged as a product of interwoven lock-in effects.

The paper is arranged as follows: Section 2 evaluates the concept of path dependency and investigates three distinct factors: self-reinforcing mechanisms, power relations and social values, and breaking path dependency. Section 3 introduces the methodology and case study context. Section 4 presents results and discussion of the findings and the Section 5 summarises the main conclusions and provides a set of emerging research gaps.

2. Path dependency

Path dependency is characterised by historical sequences of connected contingent events that set into motion institutional patterns that are linked over time and space (Wiering et al., 2017b; Wilson, 2014). Contingency, whereby viable alternative options are available to decision-makers, but they select the same options as employed as in the past, is an essential component of path dependency (Pierson, 2004, 2000; Sorensen, 2015). Indeed, deeply held assumptions become part of institutional practices and are accepted as common knowledge that becomes the central building blocks of climate adaptation policy, practice and science (Preston et al., 2015). This means that, once certain decisions are made, it is difficult for decision-makers to alter course or to adopt alternative options (Pierson, 2000). Institutions are embedded in path dependency if they: 1) define the problem in similar terms; 2) use the same type of knowledge as previously; 3) seek to analyse recurrent or new climate risks using similar kinds of questions and analytical techniques; 4) only seek to include partner organisations, interest groups, and experts who share the same values and knowledge understandings; 5) use the same decision-making processes; and, 6) continue using similar metrics to measure success over time (Morgan and Barden, 2015). To understand path dependency, it is crucial to consider factors such as self-reinforcing mechanisms, power relations and social values, but also ways to break path dependency.

In situations where self-reinforcing mechanisms are present, each step along a specific pathway increases the possibility that further steps will be taken along the same path thereby reinforcing past decisions. Self-reinforcing mechanisms that can serve to maintain stability within institutional approaches to managing flood risk include fixed costs, adaptive expectations, learning effects, institutional arrangements, law, and social values (see Table 1) (Gerrits and Marks, 2008; Grothmann and Patt, 2005).

2.1. Power relations and values in decision-making

Value systems serve to reinforce past decisions. Institutional decision-making choices are not random but, rather, consequences of power struggles, political compromises, and the expression of particular values (Sorensen, 2015). Such choices are culturally specific practices encompassing both formal rules and norms as well as cognitive frames and worldviews that influence the understandings and actions of decision-makers (Mackay, 2011; Waylen, 2009). Indeed, institutions are “distributional instruments laden with power implications”, with institutional rules the embodiment of particular power relations wherein certain values, and knowledge, positions, strategies and, by extension, specific social groups are privileged or advantaged over others (Mahoney and Thelen, 2009, p. 8). To understand these patterns of advantage (and disadvantage), questions need to be asked about who benefits from a particular policy or institution, who supports the continuation of the option, and who will resist a change that is seen to disadvantage them. Where institutions are relatively stable and self-reinforcing mechanisms are strong, institutions are highly effective in ensuring decision-making outcomes occur along established pathways. Such institutions are also highly effective in offering benefits to its supporters to keep them mobilised against attempts to revise or re-interpret rules which may be counter to their interests (Sorensen, 2015). The maintenance of the institutional status quo often requires the ongoing upkeep of institution-supporting coalitions of actors and interest groups (whose values and knowledge reflect those of hegemonic social group) to ensure unwanted changes are blocked. Coalitions of actors (such as government officials, politicians, scientists, industry leaders, farmers, Indigenous leaders, and media), with a shared set of values about human–environment relations, play a critical role in path dependency through advocating for the continuation of existing policy responses, but can also lobby for change (Johnson et al., 2005; Mertha and Lowry, 2006; Sabatier and Weible, 2007).

Table 1
Self-reinforcing mechanisms.

Self-reinforcing mechanisms	Contributions to the maintaining existing approaches to flood risk
Fixed costs	Fixed costs make it difficult to leave a path. Flood risk management typically involves substantial financial investments in engineering solutions (flood infrastructure). The longer hard adaptation interventions (levees, pumping stations, seawalls) are in operation, the more efficient infrastructure becomes in terms of cost/benefit analysis (Gerrits and Marks, 2008). The fixed costs and supposed increasing (economic) returns of such hard adaptations, as well as the interdependence of flood infrastructure with dominant landscape uses, means decision-makers often consider levee-based flood protection to be more appropriate (and cheaper) than alternative options.
Learning effects	Learning effects are important in maintaining stability within institutional responses to flood management. Knowledge that supports past policy decisions is deployed within institutions through people employed with specific qualifications (such as engineers). Institutions educate their staff that particular knowledge, approaches, and practices are the correct way of defining and addressing problems (Nalau and Handmer, 2015). Such learning processes within institutions mean decisions often follow the already chosen path (Haas, 2015). As Jeffers (2014) demonstrates, learning effects are clearly evident in how coastal cities in Ireland assess and manage flood risk. In Ireland, paralleling our case study from Aotearoa New Zealand, flood management is the responsibility of experts (specifically engineers) who use their knowledge and skills within institutional structures that reinforce the narrative of floods as technical problem with technical (engineering) solution. This reliance on a single source of knowledge (quantitative risk assessment) and one type of data (instrumental records and modelling productions) results in a narrow range of strategies, with non-structural alternatives (such as spatial planning) gaining little traction (despite forming part of the national flood hazard management policy) (Jeffers, 2011, 2014; Lawrence et al., 2015, 2013).
Institutional arrangements	Institutional arrangements for flood management involve a range of actors and sectors at multiple levels, with specific roles spread across multiple layers of governance and divisions of responsibilities. The interdependency of institutions can serve to ensure stability and continuity within institutional arrangements; however, it can also make efforts to reform or adjust any one aspect of policy or institutional arrangements difficult (Sorensen, 2015). Co-ordination effects arise wherein there is a lack of responsibility and urgency between different agencies, or incomplete or fragmented knowledge held in adjacent domains or governance structures (Wiering et al., 2017b).
Social expectations	Past experiences and the institutional history of risk management at a nation or local level contributes to particular expectations amongst both decision-makers and members of the public. The construction of levees and other engineering works in a flood-prone area can provide protection to communities and infrastructure but can promote increased development within the area. Furthermore, people frequently come to expect that external agencies and hard adaptations will protect them (and their properties) from damage from flood events.
Legislation and juridical decisions Values	Legislation and decisions of the court play a stabilising effect in the formalisation of institutional rules ('rules of the game'). Social values shape not only the design and implementation of strategies, but also whether an option is considered successful and just, or unsuccessful and maladaptive. Social values are valuations people make (as individuals or as part of a group) about what is important in their daily lives and the places they live in. In Aotearoa New Zealand, as elsewhere, social values influence how institutions and individuals conceptualise and respond to flood risk.

Values are typically framed within environmental management and policy-making through three dominant conceptualisations: values as contributions to a goal; values as a magnitude of preference; or, values as priorities (Besette et al., 2017; Graham et al., 2013; O'Brien and Wolf, 2010). These framings, however, are heavily critiqued by scholars for rendering values as matters of purely technical assessments or generic lists made by experts on the basis of economic valuations, scientific knowledge, and specific social values (Graham et al., 2018; Tadaki et al., 2017). We argue that such expert-centred values as goals, preferences or priorities can serve to maintain path dependency within environmental management regimes.

More recent scholarship proposes considering values as relationships between people and ecosystems, which is more in line with Indigenous ontologies (Salmond et al., 2014; Tadaki et al., 2017). This means that, instead of asking people to choose between predefined strategies ("I prefer option A instead of option B"), the values-as-relations notions focuses on the diverse relationships that inform people's meanings and interactions with ecosystems. These values centre on how people's relationships to environments allow them to pursue a "good life" in ways that exceed simplistic accounts of instrumental (social and economic) and intrinsic (environmental) values (Chan et al., 2016). Later in this paper, we argue that a shift in focus towards relational understandings of values offers scholars the potential to examine how particular values can maintain and disrupt path dependency.

2.2. Breaking path dependency

The concept of critical junctures refers to moments in time where exogenous forces trigger abrupt changes in institutions, including the creation of new institutional arrangements and new development pathways, which can "break" path dependency (Capoccia and Kelemen, 2007). Floods can be critical junctures or trigger events that encourage the development of new approaches, prompting changes to institutional arrangements, shifts in the beliefs of actors or actor coalitions, new policies, or approaches that can break path dependency (Wiering et al., 2017b). Scholars, drawing on socio-technical transitions theorising,

similarly argue that trigger events such as public protests, disasters, and changes in political leadership present opportunities to take action to address environmental problems through the formation of new policies or implementation of new projects (Bulkeley, 2013; Capoccia and Kelemen, 2007; Collier and Collier, 2002). Floods can create what Geels terms a 'window of opportunity' and what Kingdon terms 'policy windows' for individuals to act as intermediaries who connect problems and alternative policy options (Geels, 2012; Kingdon, 2003). Thus, flood events can trigger moments when new institutional arrangements can be constituted thereby changing the "rules of the game" (Sorensen, 2015, p. 25). If such "rules" (be it legislation, regulations, or practices) become established and long-lasting, then the critical juncture can result in lasting outcomes. Consequently, a flood event can increase public and political salience of floods as a societal and political problem and enable changes; however, it does not always cause decision-makers or institutions to adopt an alternative pathway in the long term.

In addition to critical junctures or trigger events, incremental changes can break path dependency. Triggers such as changes in socio-economic conditions, shifts in people's attitudes towards rivers, forests, and other blue/green spaces, the emergence of new governance arrangements, and increased knowledge can contribute to revisions of existing policies and actions (Bell et al., 2017; White et al., 2010). The discursive turn towards "making room for water" within European policy-making over the last two decades presents an example of incremental change whereby increased attention is given to soft adaptations including efforts to restore wetlands, and allowing certain areas to flood on a regular basis (Wiering et al., 2017b). In the Netherlands, the "Room for the River" policy marked a shift from a longstanding and extensive dike-based system of flood protection, to include water and spatial planning and risk reduction measures (Roth and Warner, 2007). This policy change was a consequence of growing recognition amongst decision-makers that it was impossible to protect the population against floods fully and that residual risk would always remain (van Buuren et al., 2016). Rather than representing a radical break from the flood protection (engineering) paradigm, however, the Netherlands policy is instead a minor adjustment to the regime. The breaking of path

dependency necessitates re-framing the problem at hand: for example, as long as climate change is seen as a minor issue that can be dealt with using routine practices, there is little incentive to make transformative changes that could break path dependency (Nalau and Handmer, 2015).

The inclusion of different types of knowledge and values is a critical way of radically and incrementally changing approaches to manage rivers, natural resources, and environmental risks, which can contribute towards breaking path dependencies within environmental governance and management regimes (Crow et al., 2018; Jeffers, 2014). In settler societies, including Aotearoa New Zealand, the United States, and Canada, efforts are being made to redress the historic exclusion of Indigenous values and knowledges from environmental management approaches by scholars, non-governmental organisations, and government agencies as part of wider efforts to redress historical injustices against Indigenous peoples (Jackson, 2018; Tipa, 2009). In Aotearoa NZ, the need to consider Māori values is now recognised through key policy documents, including the Resource Management Act (1991) (RMA). Similarly, reforms to governance and management arrangements are enabling a diversity of different collaborative approaches to facilitate iwi involvement in freshwater management to ensure Māori interests in, and values attached to freshwater are recognised and provided for (see Appendix 1) (Harmsworth et al., 2016; Ministry for the Environment, 2017). Such collaborative processes are reshaping the institutional arrangements and operations of environmental governance and management regimes to enhance the health and wellbeing of rivers and communities (Morgan and Te Aho, 2013).

3. Context

The context of our research is the Rangitāiki Plains, a small predominately rural area of coastal lowlands (approximately 35,000 ha), located within the Whakatāne District of the Bay of Plenty region in the North Island of Aotearoa NZ (Parsons and Nalau, 2016). The local economy centres on dairy farming (more than 80 per cent) with some horticulture (3 per cent). The townships of Whakatāne (population 17,600) and Edgecumbe (1600), Te Teko (489) and Matata (645) are located beside rivers and are vulnerable to flooding (see Fig. 1(a) and (b)). The Whakatāne District comprises two main ethnic groups: Pākehā (66.3 per cent) and Māori (43.5 per cent) (Statistics New Zealand, 2013; Whakatāne District Council, 2017). The geographical boundaries include the Whakatāne River (eastern boundary), the Tarawera River (western boundary), and the Rangitāiki River (which runs through the middle). Until the early twentieth century, the three rivers converged into a single large wetland area, with multiple lagoons. Large-scale engineering works, which commenced in 1910, transformed the wetlands into a pastoral agriculture-centred landscape.

3.1. Terminology

We deliberately chose to use the term Pākehā, following on from the work of sociologists Bell and Spoonley, to refer to “New Zealanders of European background, whose cultural values and behaviour have been primarily formed by the experience of being a member of the dominant group of New Zealand” (Bell, 2014; Spoonley, 1995, p. 104). We argue that “Pākehā” frames European New Zealanders from a Māori perspective and reminds the reader of the important distinction between Māori and European experiences of colonisation (Dench, 2018, p. 24). Likewise, we use the category Māori to refer to the Indigenous people of Aotearoa NZ. While we acknowledge the specificities of iwi and hapū identities within this group, in this research, we emphasise commonalities and connections between iwi rather than focusing on differences. We similarly employ the concepts of Māori values and Pākehā values, while recognising these do not necessarily apply to all individual members of each group (King, 2012).

3.2. Social values in Aotearoa New Zealand

Pākehā values, although hard to define due to their normalisation, centre on “individualism, future-orientation, secular materialism, and a nexus of political ideas which includes equality, democratic systems and paradoxically, the power of the majority to override the minority” (Ritchie, 1992, p. 81). Indeed, as Fleras and Spoonley note, it is a widely held view amongst Pākehā that settlers did not have their own culture, and that they themselves lack a distinct history and cultural identity. Such hegemonic beliefs are founded on the assumption that the majority group “conduct their public and private lives according to universally held and superior systems and values” (Fleras and Spoonley, 1999, p. 81). This invisible normalisation serves to render Pākehā racially non-specific and contributes to many Pākehā people conflating ethnicity with nationality. Thus, it is common for Pākehā to state ‘I am just a New Zealander’ when asked to identify their ethnic group (Bell, 2014; King, 2012). By not recognising their own culture and values, Pākehā can find it difficult to conceive of alternative worldviews, values, and beliefs that may provide different perspectives on an issue (such as flooding and environmental management). This allows Pākehā the capacity (or power) to discredit different systems of knowledge, values, and beliefs as abnormal, incorrect, unscientific and impractical, whereas Pākehā perspectives (and the values that underpin those views) are deemed normal, rational, scientific, practical, and ‘just common sense’.

The future-orientation aspect of Pākehā values is also at odds with Māori values. Pākehā, Māori scholar Ranginui Walker observes, tend to emphasise the importance of planning for the future and leaving the past behind them. This is founded on notions of improvement and progress, which posit that people must act to improve things (themselves and the environment) as time passes. These notions contrast with Māori understandings of time, where:

“The past was designated *mua*, and the future termed *muri*. Both had double meanings. *Mua* also meant ‘in front of,’ or ‘ahead’. This means the past is conceived of as being in the in front of human consciousness, because only the present and the past are knowable. *Muri*, designating the future, also means ‘behind’, because the future cannot be seen. Thus, the individual is conceptualised as travelling backwards into the future, with the present unfolding in front as a continuum into the past.” (Walker, 1996, pp. 13–14)

The dominance of Pākehā worldview and values means Pākehā possess an advantage within institutions in Aotearoa NZ since most systems are already unconsciously orientated to Pākehā norms and reinforce Pākehā dominance (King, 2012; Walker, 1996). Pākehā concepts of “individuality, and values of autonomy, freedom, self-interest, entitlements ... are inconsistent with the concepts of Māori individuality where individuality is constituted on values of relationality, collectivity, reciprocity, and connectively to prior generations” (Hook, 2007, p. 4).

Historically, Māori collective values shaped society and influenced how individual Māori people understood their lives in connection to their whanau, hapū and the environment (Panelli and Tipa, 2009). Principles regarding people's whakapapa (genealogical relationships and interactions) between people, living and metaphysical worlds traced across generations (past, present, and future) underpin tikanga (Māori customary practices) (Durie, 1998; Mead, 2016; Salmond, 2017; Salmond et al., 2014). In contrast to Western ontological understandings that position people as separate from (and in command of) the natural environment, Māori worldviews situate people as part of the environment and as connected with all beings through kinship relationships. Whakapapa is central to the ongoing relationships Māori maintain with their rohe (traditional lands and waters), their respect for tupuna (ancestors), and their commitment to exercising kaitiakitanga (customary guardianship) and rangatiratanga (chiefly authority).

Māori worldviews conflict with dominant Pākehā understandings

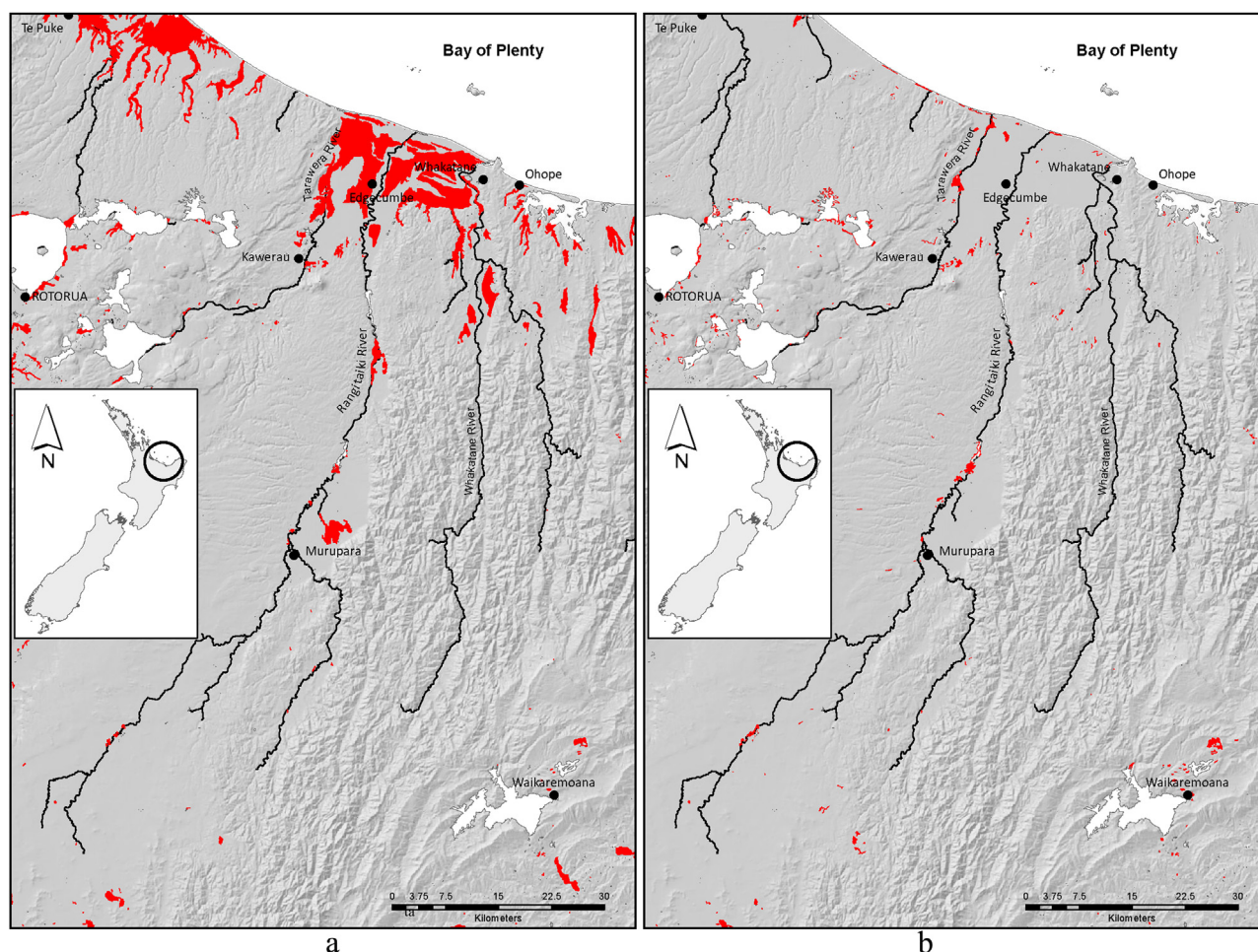


Fig. 1. (a and b) Maps showing wetlands historically and in 2017.

of, and approaches to managing freshwater resources, as our case study of the Rangitāiki Plains later demonstrates (Hall, 2012; Harmsworth et al., 2016; Salmond et al., 2014; Te Aho, 2011). Customary Māori tenure resembled common property relations and usufruct rights, where rights to land and resources were held by an iwi or hapū, and notions of authority were embodied through mana, rangatiratanga and kaitiakitanga (Hall, 2012). As kaitiaki (guardians), iwi and hapū are responsible for the maintenance of mauri (life force), wairua (spirit), and mana (power) of their rivers.

4. Methods and materials

We employ a historical geography approach to examine environmental changes in the Rangitāiki Plains during the period 1910–2017 (Adamson, 2014; Endfield, 2007; Parsons and Nalau, 2016). Within historical research, materials (both written and non-written) produced in the time period under examination are classified as primary sources, whereas materials created after the time period are secondary sources (Brundage, 2017). Accordingly, we draw on primary sources held in archives, libraries, museums, and private collections (Howell and Prevenier, 2001) (see Appendix 2 for a full list of primary sources).

Data were located through word searches (Rangitāiki, flood, water, wetlands, swamps, drainage) of archival catalogue systems. Once identified, materials were analysed qualitatively based on themes. Our analysis involved several key steps including familiarisation, recording, coding, and narrative construction. Familiarisation involved the detailed reading of historical documents and the creation of timelines of legislation and key events; relevant information was then recorded,

including quotes from sources. A simple coding technique was employed to differentiate relevant themes and key events. Codes were then analysed and sorted into potential themes (Māori dispossession, wetlands drainage, flooding, river management, the narrative of improvements, engineering expertise, self-reinforcing mechanisms, and values). After all codes were distributed into themes, themes were reviewed in regards to supporting documents and edited. The selected themes were then organised in a thematic map of the research data and subsequently named and specifically defined. The fourth stage involved narrative construction. We draw on historical practice wherein historians construct narrative arcs; a process that involves the identification and collation of relevant primary data sources, the translation, analysis, and representation of those materials (Cameron, 2015). These narratives are not invented but, rather, are empirically based; they “cannot contravene known facts about the past” (Cronon, 1992, p. 1372). Put simply things happen in a particular order, there is a chronology of events, and historians are “bounded at every turn by the evidence they can and cannot muster in their support” (Cronon, 1992, p. 1372).

5. Background: freshwater systems of Rangitāiki Plains in the nineteenth century

Formal colonisation of Aotearoa NZ commenced in 1840 with the signing of the Treaty of Waitangi between the British government and representatives of various Māori tribes (Ballantyne, 2012; Belich, 2001; Orange, 2015). At that time, the freshwater systems of the Rangitāiki, Tarawera, and Whakatāne were significant food gathering areas (ma-hinga kai) for local Māori communities. Important food sources

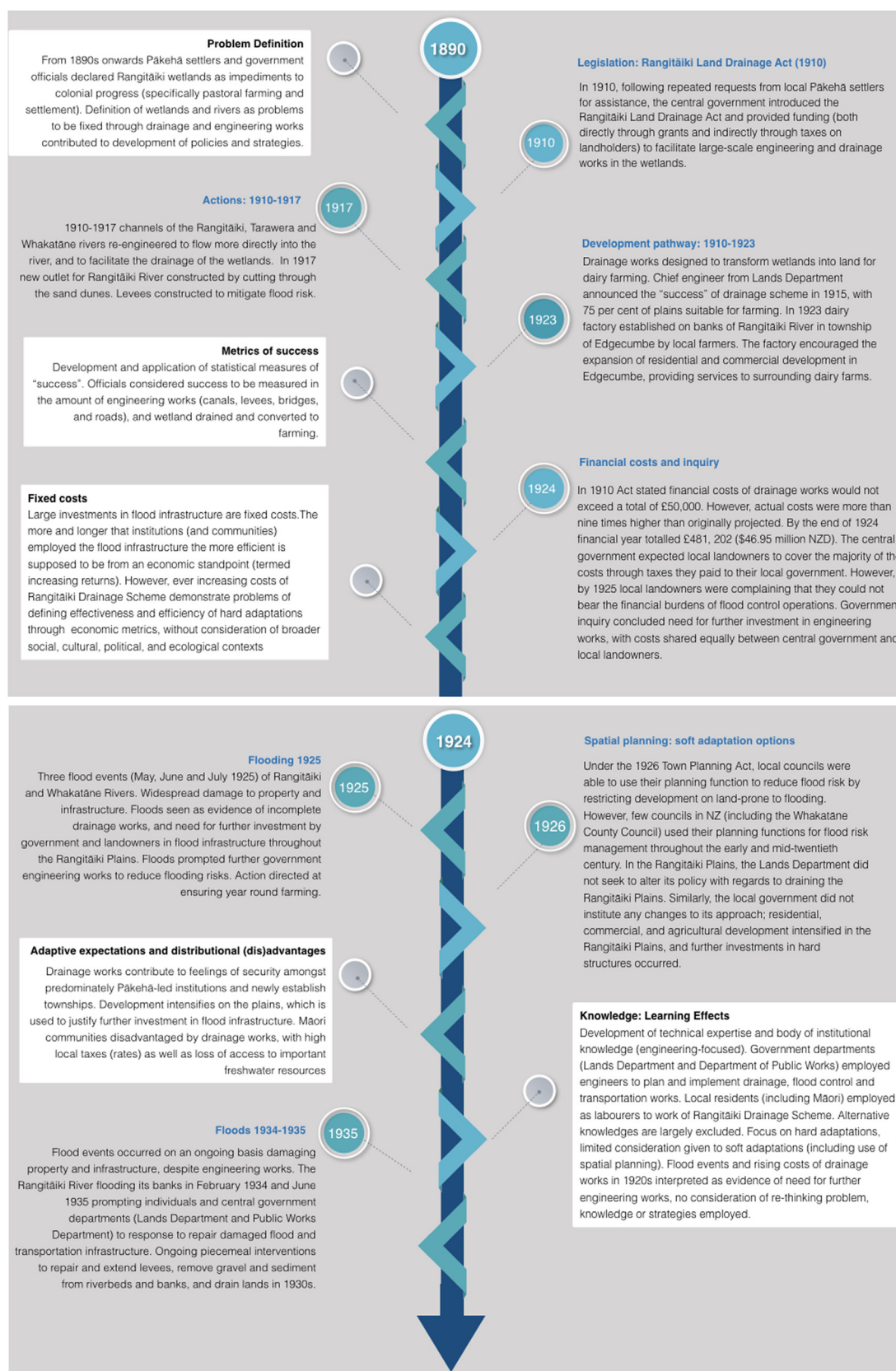


Fig. 2. Timeline of Rangitāiki drainage and flood scheme 1890s–1930s.

included fish species like tuna (freshwater eels – *Anguilla spp.*), and inanga (whitebait – *Galaxias spp.*), and a multitude of bird species (Rangitāiki River Forum, 2016; Te Pahiopoto Hapu, 2017; Te Runanga

o Ngāti Awa, 2016; Waitangi Tribunal, 1999). In the middle and upper reaches of the Rangitāiki River, elders of Ngāti Manawa and Ngāti Whare described how “eels and eeling and the rivers [were] the

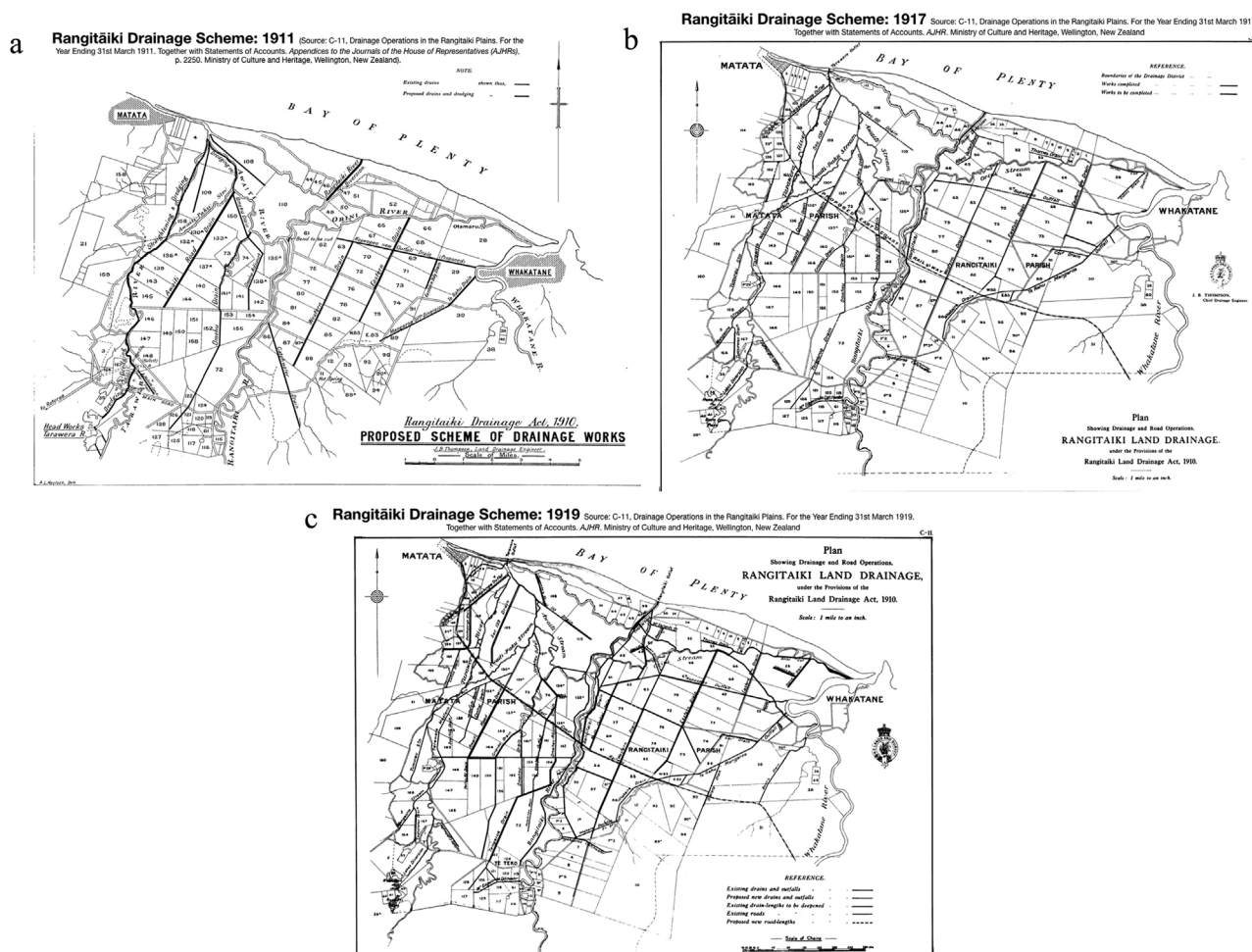


Fig. 3. (a–d) Government maps of Rangitāiki drainage scheme 1911, 1917 and 1919.
Source: AJHRs, National Library, Ministry of Cultural Heritage. Creative Commons 3.0.

lifeblood of the people” with eels considered taonga (treasure) and the centre of their “eel culture” (Waitangi Tribunal, 1998). Individuals, whanau and hapū maintained customary usage rights to resources and particular freshwater places, including tauranga ika (landing places for canoes), pā tuna (eel weirs), and fishing locations, by erecting wooden posts (pou) along rivers, and by the imposition of rahui (prohibitions that instructed people to keep away) (Waitangi Tribunal, 1998).

The catchments of the three rivers encompass the rohe of Ngāti Manawa, Ngāti Whare, Ngāti Makino, Ngāti Pikiao, Tūhoe, Ngāti Tūwharetoa ki Kawerau, and Ngāti Awa. Unlike western scientific knowledge, Māori do not draw a clear separation between different freshwater places, social and ecological health and wellbeing (Te Pahiopoto Hapu, 2017; Waitangi Tribunal, 1999, 1998). For Ngāti Manawa and Ngāti Whare, “the very spiritual being of every whanau is part of the [Rangitāiki] river ... [i]n this sense the river is more than a taonga [treasure] ... it is the people themselves” (Waitangi Tribunal, 1998, p. 13).

In the Rangitāiki Plains, like elsewhere in Aotearoa NZ, dispossession and marginalisation of Māori were inextricably tied to ecological transformation associated with British colonisation (New Zealand Government, 1866a,b) (see Appendix 3). Actions to displace Māori, using military, legislative, and judicial processes, were part of settler colonial efforts to create new Pākehā-led institutions, communities, economies, and remake the landscapes and waterscapes to accord to what Pākehā envision were productive and healthy spaces. After more than a century of Māori protests, the central government established a permanent commission of inquiry (Waitangi Tribunal) to investigate

Māori claims about Treaty breaches by the government, which included Māori dispossession, discriminatory policies, and degradation of environments (Lashley, 2000; Orange, 2015; Seuffert, 2005; Wheen and Hayward, 2012). The Tribunal is only empowered to non-binding recommendations about the resolution of Treaty claims. A separate government agency (Office of Treaty Settlements) is responsible for negotiating Treaty settlements with iwi. Settlements typically include formal apologies for historical wrongs; financial reparations; land purchasing agreements; and co-governance rights (Bay of Plenty Regional Council, 2017; New Zealand Parliament, 2012a,b). Since 2003, the majority of iwi affiliated with the Rangitāiki Plains have signed settlements, including Ngāti Awa, Ngāti Tūwharetoa, Ngāti Whare, Ngāti Manawa, and Tūhoe.

6. Results

The history of the Rangitāiki Plains is a product of a series of decisions over time triggered by interdependent social, economic, political, and environmental changes associated with settler colonisation. In this section, we discuss three distinct phases in the pathway development: the formation (1910s–1930s), path continuation (1940s–2000s), and destabilising the path (2010s–2017).

6.1. Formation of the path: 1910s–1930s drainage and river “improvements”

Actions to transform the Rangitāiki Plains from wetlands into



Fig. 4. Drainage canal constructed by hand through Rangitāiki wetlands in 1910.

Source: Sir George Grey Special Collections, Auckland Libraries, AWNS-19100721-16-4).

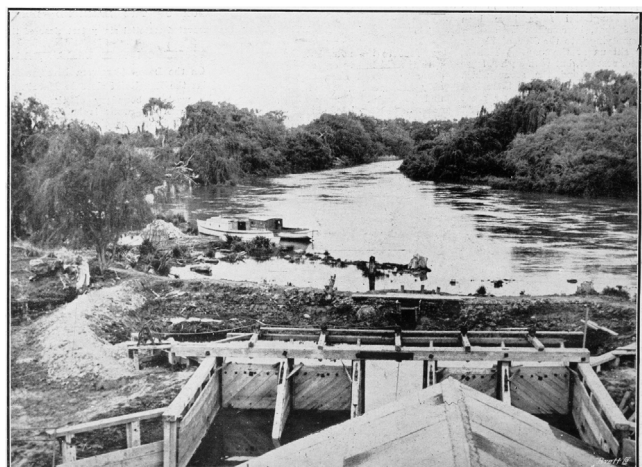


Fig. 5. Government engineering work on Rangitāiki River, including the temporary construction of dam, in preparation of the construction of a new river outlet in 1912.

Source: Sir George Grey Special Collections, Auckland Libraries, NZG-19121106-33-2.

grasslands began in the decades following the 1865 military invasion and confiscation of Māori land (see Appendix 3). The central government undertook land surveys in the Rangitāiki wetlands and made leasehold and freehold lands available for development in the 1890s. Between 1894 and 1910, Pākehā attempted, unsuccessfully, to drain the Rangitāiki wetlands. In 1910, following repeated requests from Pākehā residents for assistance, the central government introduced legislation (New Zealand Parliament, 1910) and provided funding (both directly through grants and indirectly through taxes on landholders) to facilitate large-scale engineering and drainage works (see Fig. 2) (AJHR, 1911; Department of Lands and Survey, 1908; New Zealand Parliament, 1910). As part of the wetlands drainage, river realignment, and flood control operations, the lower portions of the Rangitāiki, Whakatāne and Tarawera rivers were almost entirely re-engineered between 1910 and 1917 (see Fig. 3(a–c)) (AJHR, 1918, 1911). The Rangitāiki River was straightened with a new outlet constructed through the sand dunes to

more directly flow into the Pacific Ocean (see Figs. 4 and 5); previously, the river flowed through a series of lagoons and merged with Tarawera River and flowed into the ocean at Matata.

The decision to drain the Rangitāiki wetlands and re-align the rivers was based on Pākehā subjectivities that perceived Aotearoa NZ's porous floodplains as unpredictable, unproductive, and potentially hazardous spaces. Wetlands and floods were interlinked problems requiring concerted efforts by individuals and governments to address. Between 1901 and 1926, the central government undertook 20 commissions of inquiry to investigate the problems (“swamps”, flooding, pollution) affecting rivers throughout the country (AJHR, 1926, 1910, 1900). These inquiries resulted in the implementation of successive legislation to re-engineer freshwater systems, with the Rangitāiki Drainage Scheme one of 69 major drainage and river “improvements” schemes implemented during the first half of the twentieth century (Knight, 2016), and one of only two central government-run land drainage projects (the other being on the Hauraki Plains) in the first half of the twentieth century (AJHR, 1913a; Department of Lands and Survey, 1908). In both areas, the large wetlands were seen as impediments to progress, and central government intervention came after unsuccessful attempts by Pākehā landholders to drain the areas (AJHR, 1913a; McDonald, 2002). Elsewhere in the country, drainage was the responsibility of local drainage boards (comprised of elected officials) (New Zealand Parliament, 1922, 1920, 1908).

By the start of the twentieth century, engineers employed by central government were tasked with charting, measuring, and controlling the three rivers of the Rangitāiki Plains, and establishing clear divisions between water and land as a means to facilitate productive pastoralism (AJHR, 1926, 1915, 1913b; Department of Lands and Survey, 1908). These experts determined that rivers should be fixed in width and course. Consequently, the “tortuous course” of the Tarawera, Rangitāiki and Whakatāne rivers through the “vast sea of swamp” was corrected, re-aligned, and channelled to flow more directly to the ocean (see Fig. 5) (Du Pontet et al., 1964, p. 52–53). Technical knowledge and new technologies, including dredging machines imported from England and the United States, provided the justification and the means to enable radical changes to the Rangitāiki Plains (AJHR, 1911; Law, 1962; New Zealand Parliament, 1910).

The systematic drainage of the wetlands and alterations of river systems established a particular development pathway: pastoral agriculture. Throughout the floodplains, workers and dredging machines constructed canals to drain the land and built levees to prevent flooding and unwater the land to make it suitable for farming operations (AJHR, 1918, 1915, 1911). The central government reported in 1911 that, while the Rangitāiki area possessed “rich alluvial [and] pumice soil”, the regular flooding of the Tarawera and Rangitāiki Rivers “greatly retarded the settlement of the district and the profitable utilisation of the lands” (AJHR, 1911). Government officials monitored the unwatered landscape that emerged from the Rangitāiki drainage operations for “active signs of farming” and suitability for year-round farming (AJHR, 1915). Drainage efforts coincided with the construction of transportation links and urban and industrial development in Whakatāne and Edgecumbe, which included the establishment in 1923 of a dairy factory in Edgecumbe by the Rangitāiki Plains Dairy Co-op. In addition to drainage and river realignment interventions, individual landholders were responsible for clearing forested areas of land and planting introduced grasses and other vegetation. Non-government organisations (acclimatisation societies) and individuals, supported by legislation and government funds, introduced exotic flora and fauna (AJHR, 1906; Ashby, 1967). These actions were directed at radical changes to transform the “previously useless swamp” and Indigenous forests into “the most valuable” land for agriculture (AJHR, 1913b).

As the twentieth century progressed, flood control structures emerged as a central component of improvements, with ongoing and worsening problems with flooding on the Rangitāiki Plains (see Figs. 5 and 6) (Commission of Inquiry, 1925; New Zealand Government,

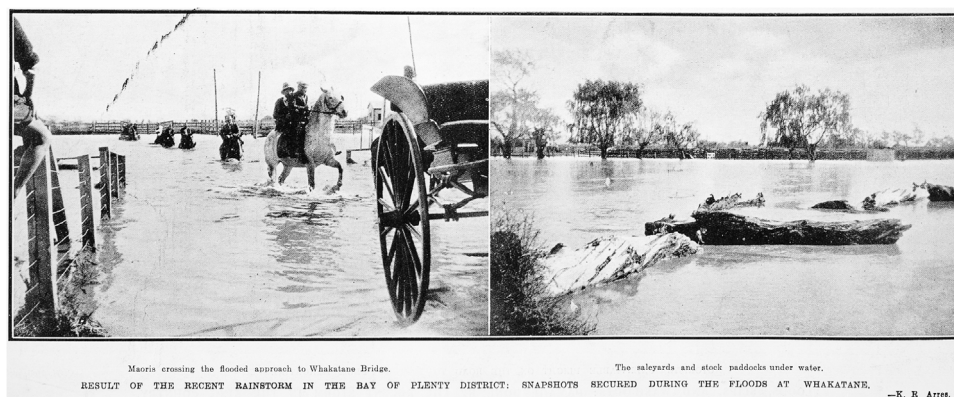


Fig. 6. Photograph of flood event on Rangitāiki Plains in 1925.

Source: Sir George Grey Special Collections, Auckland Libraries, AWNS-19250604-50-4.

1924). A large flood event on the Rangitāiki River in 1925 prompted central government declarations that further “capital expenditure” on flood infrastructure would materially improve the effectiveness of the existing drainage scheme. The ability to drain “floodwaters” of the land “within twenty-four hours” would allow even the most low-lying lands to be useful for grazing and, thus, costs (which were already more than nine times higher than initially projected by the government) were entirely justified (AJHR, 1926). The flood event saw the central government renew its focus on construction and maintenance of hard adaptations (Commission of Inquiry, 1925; New Zealand Government, 1926).

Drainage and flood control works profoundly affected the small amount of land remaining in Māori ownership, with hard adaptations contributing to the acceleration of Māori land loss. Actions to drain the wetlands and re-engineer the rivers of the Rangitāiki floodplains occurred irrespective of whether individual landholders wanted their properties drained and converted to introduced grasslands or not. However, since Pākehā landholders actively campaigned for the government drainage scheme and occupied positions of power within local government (as elected officials) or industry bodies (most notably the farming lobby group Federated Farmers then known as the Farmers Union), Māori landholders were most affected by this approach (New Zealand Parliament, 1950, 1900). Both central and local government acquired more Māori land through legislation as well as through individual Māori landholders selling their lands as a result of heavy taxation and increased land values (New Zealand Parliament, 1950; Waitangi Tribunal, 1999). Officials frequently voiced dissatisfaction with Māori landholders for slowing down the process of land conversion and for failing to pay levies imposed by governments to offset the costs of drainage operations. They perceived the lack of individual actions as a threat to the effectiveness of drainage and flood infrastructure schemes (potentially curtailing further investments) and to the success of economic development (New Zealand Parliament, 1950, 1900; New Zealand Parliamentary Debates, 1937, 1926).

These critiques continued even after separate legislation was introduced to empower the central government to drain wetlands on Māori land and impose levies on landholders. Once drained and converted to grasslands, Māori land (which was held under collective title) was subject to a high level of government scrutiny, reflective of widespread belief amongst Pākehā that Māori failed to use their lands productively (Boast, 2008; New Zealand Parliament, 1950, 1900). Drainage works negatively impacted not only landowners; Māori residents of the small village of Matata, which was at the mouth of the Tarawera and Rangitāiki rivers until engineering works, recounted how their trading and shipping businesses went into decline because they could no longer moor their boats in the lagoon due to lack of water and sedimentation. Commentators repeatedly emphasised that Māori needed to “learn to adapt themselves to the new era” and “keep up with [their]

more experienced pakeha neighbours” (Cowan, 1930, p. 18). Such views served to justify policies and practices that further dispossessed and marginalised Māori communities, re-engineered freshwater systems, and established institutional arrangements and developments underpinned by western knowledge and values.

6.2. Path continuation: 1940s–2000s flooding and the role of local government

By the 1940s, more than 90 per cent of the Rangitāiki wetlands were drained. Government officials and local Pākehā declared the Rangitāiki drainage scheme a wholesale “success” (Unknown Author, 1945a) (see Fig. 7). The loss of wetlands, biota change, and development of urban areas, all contributed to alter river flow and behaviour and increase flood vulnerability. The first major flood occurred in 1925, the next in 1944, and so on throughout the twentieth century (and into the twenty-first) (see Figs. 8 and 9). Each flood event sparked political and public discussions about how to solve the flood hazard, which ultimately reinforced existing institutional arrangements. The 1944 Edgumbe flood illustrates how local institutions and coalitions of actors remained committed to the established path, with fixed costs, learning effects, and social values reinforcing initial problem definition and decision-



Fig. 7. Edgumbe, Bay of Plenty, road bridge over Rangitāiki River, looking towards Whakatāne July 1965.

Source: Whites Aviation Ltd.: photographs. WA-64965-F. Alexander Turnbull Library, Wellington, New Zealand.

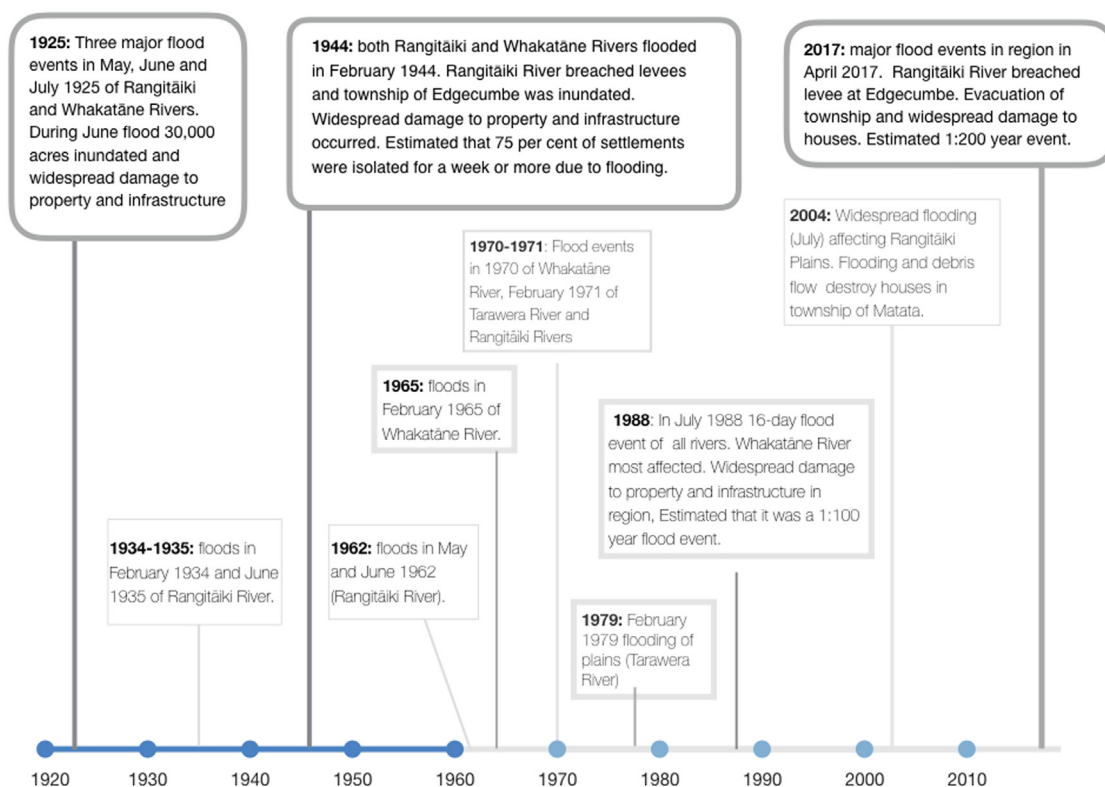


Fig. 8. Major flood events within Rangitāiki Plains from 1920s to 2010s.

making.

On 24 February 1944, a regional newspaper reported, “heavy rain from the high back country ... transformed the three main rivers [of the Rangitāiki Plains] into roaring torrents of water which swept across the landscape in a destructive blood flood”. Farmers “suffered serious losses, involving hundreds of head of valuable high producing dairy stock”. The most severe flooding occurred along the Rangitāiki River, where the river overflowed its levees and flooded the township of Edgecumbe (Unknown Author, 1944). “Settlers” in Edgecumbe waged an “all-night battle ... against the flood water” using sandbags to fill the gaps in the levees. Ultimately their efforts were futile and water “inundated the[ir] ...houses and shops” (Unknown Author, 1944). Following this event, the Lands Department, the central government agency responsible for the Rangitāiki drainage scheme, instructed its Chief Engineer to investigate the cause of the Edgecumbe flood.

The Chief Engineer's report concluded that the flood event was the result of inappropriate (and unwanted) development near a known hazard. The Minister of Lands remarked that the development of Edgecumbe township was an undesired outcome of the government's drainage operations and the establishment of a dairy factory. Furthermore, the three decades of construction of canals, river realignment was “for the purpose of developing the rich farmlands of the district”, rather than facilitating residential or commercial developments (Unknown Author, 1945b). Officials from central government informed the local government that no new developments were to be permitted in Edgecumbe due to its high vulnerability to flooding and strict spatial planning restrictions were to be applied; there was even mention of relocating the entire township away from the river to reduce exposure (Unknown Author, 1945b,c). A potential plan for more extensive flood structures along the banks of the Rangitāiki River was mooted; however, the Chief Engineer concluded that such a plan “would materially increase flood risk in the township [of Edgecumbe] because the greater volume of water which would be released in the event of a break-through” (Unknown Author, 1945b). The central government's plan was in line with legislative changes that encouraged

the use of spatial planning as a way to mitigate flood risk.

This potential policy shift by central government, away from a singular focus on engineering knowledge and strategies to manage the Rangitāiki River, was met with widespread condemnation from local residents and officials (Unknown Author, 1945c). Members of Whakatāne County Council declared that residential and commercial development would continue apace in Edgecumbe, irrespective of the central government agency's report and Ministerial decree. Representations of the Rangitāiki Plains as spaces of ongoing technical, ecological, and social improvement, with acts of drainage and engineering evidence of a modernising state, were used by local government officials and residents to advocate for the continuation of the institutional status quo.

Under the 1926 Town Planning Act, local councils including the Whakatāne County Council were able to use their planning function to reduce flood risk by restricting development on land-prone to flooding (New Zealand Parliament, 1926). The introduction of the Town and Country Planning Act 1953 further strengthened councils' abilities to use planning as a means to reduce flood risk. However, few councils in Aotearoa NZ did so (Knight, 2016; New Zealand Parliament, 1953).

The existence of alternative strategies, such as planning, highlight clear contingency, which is a characteristic of path dependency. Local government authorities remained firmly fixed on hard adaptations as the principle approach to address flood risk. In the Rangitāiki Plains, the Lands Department's 1945 report did not translate into tangible actions. The central government did not introduce a new policy regarding drainage or flood controls in the area. Similarly, local government did not institute any changes to its approach; the township of Edgecumbe remained in its existing location, residential, commercial, and agricultural development intensified in the Rangitāiki Plains, and hard structures remained in place (Law, 1962; Unknown Author, 1945b).

The 1950s marked a transition towards an increasingly decentralised approach to governing drainage and flooding on the Rangitāiki Plains. As a result of local landholders' requests, new legislation transferred authority over the Rangitāiki Drainage Scheme from central government to a local government authority, the Bay of Plenty

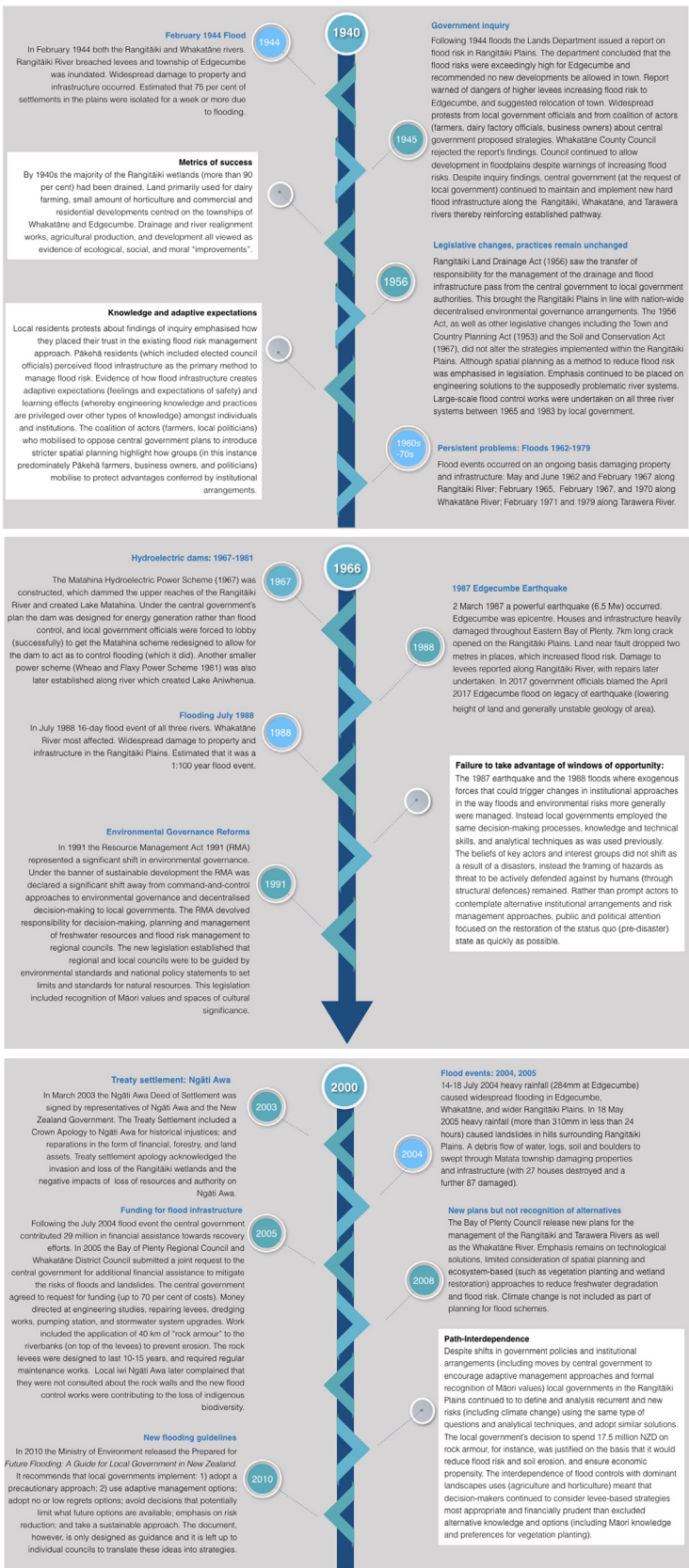


Fig. 9. Timeline of Rangitāiki Plains drainage and flood risk management scheme 1940s–1960s.

Catchment Commission (New Zealand Parliament, 1956; New Zealand Parliamentary Debates, 1956). Drainage became rebranded as flood controls; however, the existing engineering paradigm remained

unchanged (Rangitāiki Drainage Board, 1962). Indeed, support for the existing institutional arrangements to manage flooding and the construction and re-construction of hard structures remained strong

amongst interest groups (the local ratepayers' association, farmers, and related industries) despite ongoing flood events. Pākehā residents' attachments to place centred on the retention of the culturally modified landscapes their ancestors created, and they themselves were actively seeking to maintain. Residents recalled how ancestors had used "every ounce of their strength ... into transforming the arable pasture as well as creating the vibrant community" of Edgumbe, despite ongoing flood events (Du Pontet et al., 1964, p. 50).

Past experiences and institutional history contributed to expectations amongst both decision-makers and members of the public that hard adaptations were the best (seemingly the only) way to manage the persistent problems of the uncontrollable waters. In their oral histories and memoirs, many Pākehā, particularly farmers, narrated their experiences of and interactions as seemingly endless 'battle' against 'nature' to retain the grassland landscape that they (or their ancestors) had created and valued, paralleling experiences elsewhere in Aotearoa NZ (Du Pontet, 1892; Du Pontet et al., 1964; Gibbons, 1990, 1988; Secombe, 1959a,b,c,d). In 1961, for instance, one "wet country" farmer described the need for "constant vigilance by the occupier; if there is any easing up, the pasture will soon revert to rushes and weed grasses and the soil will become waterlogged" (Reynolds, 1961, p. 65).

In contrast to Pākehā, iwi and hapū did not perceive drainage and flood controls as "improvements" on the landscape. Māori regularly petitioned members of parliament and government officials about their loss of lands, resources, and degradation associated with drainage and flood controls (Bamford and Brown, 1909; Department of Maori Affairs, 1915; Te Anga, 1914). In these petitions, Māori challenged scientific knowledge, technologies, and Pākehā values, and sought to re-assert Māori knowledge, values, and ways of living (AJHR, 1927, 1923; Waitangi Tribunal, 2009, 1999). In addition to requests for the return of Māori lands and financial compensation for the loss of land and resources, Māori petitioners expressed concern about their loss of access to resources as a consequence of government policies. Generations of Māori from the Rangitāiki catchment wrote and spoke out about the negative consequences of environmental changes to their rohe including the decline in Indigenous flora and fauna, infectious disease outbreaks linked to polluted water supplies, and loss of sites of cultural significance (Unknown Author, 1943). Elders from two iwi groups (Ngāti Manawa and Ngāti Whare), for instance, recounted to the Waitangi Tribunal inquiry the loss of their "eel culture" as a consequence of the construction of the Matahina Dam as they were unable to undertake traditional harvesting practices (Park, 2001, p. 200; Waitangi Tribunal, 1998, 1993). While central government officials did sometimes acknowledge that Māori petitions had merit, they repeatedly expressed the view that land development, drainage operations, and flood controls were more important (economically, socially, and politically) to the nation and Whakatāne district than Māori livelihoods (Te Anga, 1914).

In the 1980s and 1990s, new legislation saw environmental planning and resource management increasingly focused on local-level decision-making. In 1989, regional councils were established and assumed responsibility over rivers and flood management (taking over from catchment boards). In 1991, the Resource Management Act (RMA) was enacted and empowered city and district councils to restrict development and land use because of flood risk. The RMA and the Local Government Act 2002 (LGA), and subsequent amendments, also required that local government authorities actively engage and include Māori in decision-making processes at a local level (New Zealand Parliament, 2002, 1991). Despite these policy changes, which emphasised the need for inclusive decision-making that moved beyond technical knowledge, path dependency was evident in how institutions chose to manage flood risk. For example, in the aftermath of flooding in 2004, Bay of Plenty Regional Council and Whakatāne District Council applied for and received funding from central government to enhance the flood controls in Edgumbe and along Rangitāiki River (Askey, 2011; Fairbairn, 2015). The completed engineering works included new

and retrofitted levees, rock walls along riverbanks, and pumping stations. One of the engineers involved declared the new works as evidence of ongoing "improvements" to the district:

"When viewed in the context of 100 years of land development and drainage on the Rangitāiki Plains ... the [recent engineering] works ... are just further steps on a continuum of improvements. Such improvements are needed to accommodate changing land use, changing community expectations, and changing climate." (Askey, 2011)

Except for the mention of climate change, similar statements about the Rangitāiki drainage and flood interventions have been expressed by Pākehā actors for more than a century. In such a narrative, climate risks are rendered a technical problem to be solved through the application of engineering knowledge and skills. Indeed, in 2010 the local council, in collaboration with farmers, began investigating the possibility of developing irrigated agriculture in the Rangitāiki Plains to decrease drought vulnerability amongst dairy farms (Tozer et al., 2010; Unknown Author, 2017a). In keeping with dominant Pākehā future-orientated values, these actions to physically transform the landscape/waterscape were narrated as evidence of individual, social, economic, and environmental improvements. Despite legislative requirements under the LGA and the RMA for local government to include Māori perspectives in environmental decision-making processes, this did not translate into substantive changes in how local government sought to manage the rivers of the Rangitāiki Plains and manage flood risk (see Fig. 10).

6.3. Disrupting path dependency: 2012 onwards

In 2013, the Rangitāiki River Forum was established to guide the management of the river. The Forum emerged as a consequence of Treaty settlements between the Crown (represented by the central government) and two iwi (Ngāti Whare and Ngāti Manawa) in 2012. The Forum comprises representatives of local government (Whakatāne District Council and the Bay of Plenty Regional Council) as well as iwi of the Rangitāiki River (including Ngāti Whare, Ngāti Awa, Ngāti Tuwharetoa, and Ngāti Manawa). The purpose of the Forum is to protect and enhance "the environmental, cultural, and spiritual health and wellbeing of the Rangitāiki River and its resources for the benefit of present and future generation" (Rangitāiki River Forum, 2016). The Forum produced the Rangitāiki River Document, in consultation with Treaty partners and stakeholders, which informed the development of a proposed change to the Regional Policy Statement (RPS) (Bay of Plenty Regional Council, 2017; Rangitāiki River Forum, 2016). The proposed policy change sought to recognise iwi relationships with the Rangitāiki River formally, and address the negative impacts of human activities (Bay of Plenty Regional Council, 2017; Rangitāiki River Forum, 2016). The proposed policy change also sought to improve water quality, restore Indigenous flora and fauna, and support Māori kaitiakitanga to be enacted (Bay of Plenty Regional Council, 2017, 2016). The regional council undertook public consultations, which allowed for written submissions and oral presentations at public hearings, on the proposed policy change from late 2017 until July 2018. Representatives from iwi and hapū, local and national industries, government agencies, as well as local farmers and non-government organisations made submissions (see Appendix 4). Unsurprisingly, the iwi and hapū written submissions were in favour of the proposed policy change (Te Pahiopoto Hapu, 2017; Te Runanga o Ngāti Awa, 2016). Iwi and hapū submissions, including those made by iwi business, emphasised Māori relational ontology and values that positioned historical experiences of political, social, and economic marginalisation (loss of mana) as interlinked with the environmental changes to their rohe. Efforts to address Māori socio-political marginalisation (through the re-assertion of mana) were interwoven with strategies aimed at improving the environmental and spiritual health of the river through the restoration of Indigenous

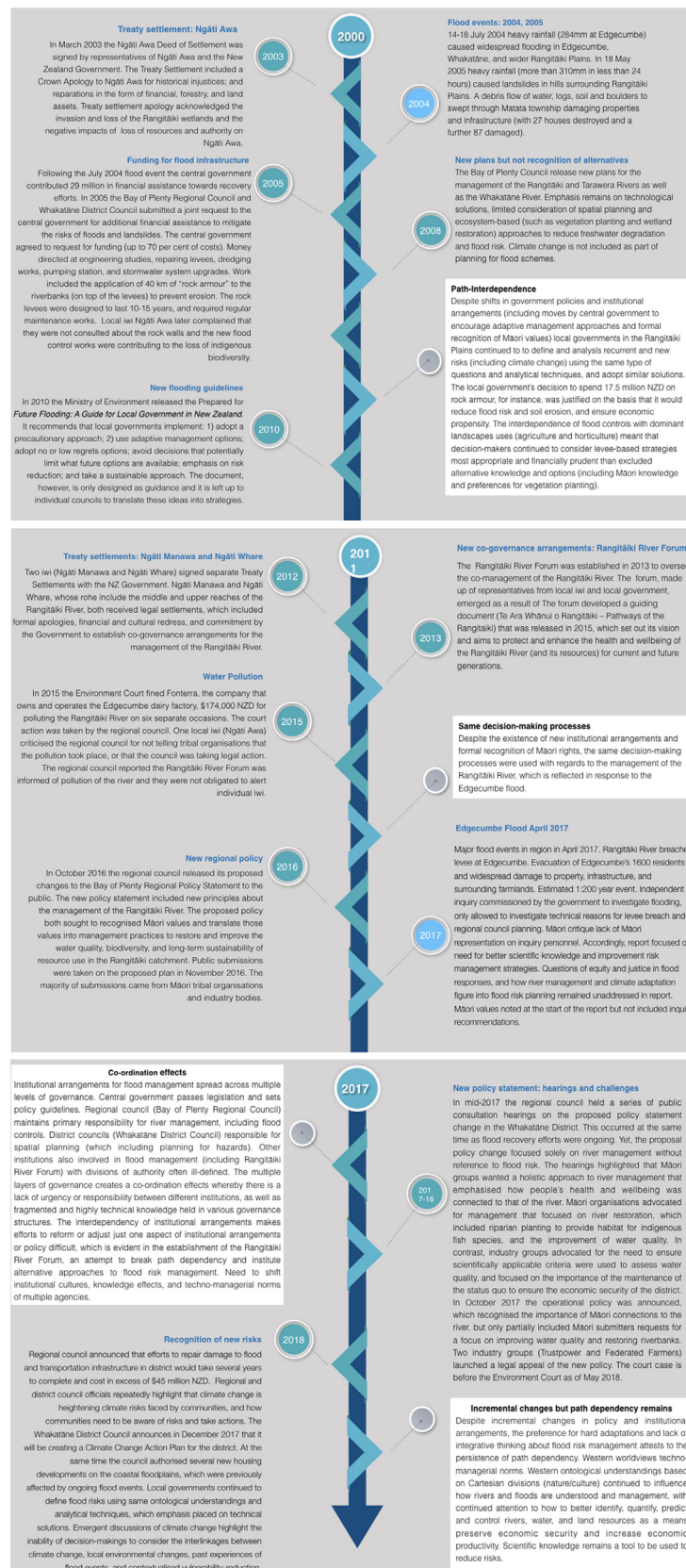


Fig. 10. Timeline of key events in Rangitāiki flood risk management scheme 2000s–2010s.

vegetation and biota along Rangitāiki River in place of rock walls (Bay of Plenty Regional Council, 2017, p. 3, 2016; Te Pahiopoto Hapu, 2017). Submissions from farming and industry bodies were less

supportive of the proposed change in policy and requested numerous changes to the proposed policy to ensure it did not impede their economic activities.

In April 2017, another major flood event occurred on the Rangitāiki Plains, with Edgecumbe most severely affected (RRSRP, 2017; Unknown Author, 2017b,c). As the Chief Engineer warned in 1945, one of the levees failed and floodwaters rushed through the township. The population received limited or no warning and were forced to self-evacuate using boats and trucks (Leask, 2017; RRSRP, 2017; Riederer, 2017; Unknown Author, 2017d,e). Although no loss of life occurred, hundreds of properties were severely damaged, and widespread damage to community infrastructure occurred. The flooding followed on from more 270 mm of rain in two days in the Whakatāne district (the third-highest since record-keeping began). The Mayor of Whakatāne declared the flood unprecedented, unpredicted and, therefore, unavoidable (Akuhata, 2017a; Unknown Author, 2017d,f,g). Widely reported statements by officials declaring it a 1–500 year event seemingly confirmed the extraordinary nature of the flooding (this figure was revised down to 1–200 year upstream and 1–100 year downstream) (Edens, 2017; RRSRP, 2017; Unknown Author, 2017c).

In the wake of the April 2017 flood, the government announced an independent inquiry to investigate the flood. The inquiry panel, comprised of a former member of parliament and two engineers, were only allowed to examine the technical reasons for the breach of the levee as well as the implementation of the Regional Council's flood risk management scheme. This prompted some residents to express concern that the focus of the inquiry and the technical expertise of the panel members did not provide sufficient voice for local and Māori knowledge and values (Akuhata, 2017b; Dawson, 2017). Indeed, the inquiry's final report, while acknowledging the close connections of iwi and hapū to the Rangitāiki River and the Rangitāiki River Forum, focused on biophysical and technological dimensions (RRSRP, 2017). The panel concluded there was a need for 1) better technology (the height of the levees needed to be raised); 2) better scientific knowledge; and 3) better longer-term planning. Although the panel mentioned the European “making room for the river” policy, they were unwilling to recommend a substantive shift in flood risk management. The panel reported that, while allowing “rivers to revert to their natural behaviour is an option for consideration,” such approaches were “prohibitively expensive to implement” and there was insufficient funding to allow councils to adopt this approach (RRSRP, 2017, p. 116).

From the outset, the composition of the inquiry panel and its technical focus ensured path dependency (see Fig. 11). The inquiry relied on engineering-focused knowledge and similar metrics as in the past to define the problem, assess risks, and recommended mostly technocratic solutions. Although the inquiry was officially independent of local and central governments, their report largely supported council decision-making and did not ascribe blame for the flood event or the levee breach to an individual or institution. Just as in 1945, a coalition of local actors mobilised to advocate for and ensure the maintenance of the existing flood risk management path and to advocate for “scientifically based approaches” river management policy (a rejection of the planned inclusion of Māori knowledge into policy) (Fonterra Co-operative Group, 2016, p. 6; Tozer, 2014; Unknown Author, 2017a).

For local government, the report validated institutional arrangements and responses, and placed responsibility for flooding on natural processes. Doug Leeder, the Chairperson of the Bay of Plenty Council, framed the April 2017 flood as a story of the region's unruly natural environmental conditions; despite the best efforts of people to mitigate flood risks “[y]ou can never guarantee that you can withstand the force of Mother Nature” (McLeod, 2018).

In contrast, public reception of the inquiry report was mixed. For local farmers, the report lacked details about the financial aspects of adaptation; one farmer wrote to the local newspaper to demand the government invest in higher levees to protect farming houses and properties (Gow, 2017). In 2018, a group of people affected by the April 2017 flood launched a class action lawsuit against the Bay of Plenty Regional Council alleging that the council failed to meet its legal responsibilities to address flood risks faced by local residents. Graeme

Bourke, the Edgecumbe resident leading the lawsuit, declared in interviews with journalists that the April 2017 flood was “a man-made disaster, it wasn't a natural disaster, I won't let them get away with describing it that because it wasn't” (McLeod, 2018).

The Forum stayed quiet in public discussions of the flood response and recovery, and did not comment on the inquiry report. The Forum were not officially involved in decision-making about flood recovery, or future risk planning but announced plans to restore six wetlands in the middle and upper reaches of the river which would commence in 2018–2019. Various hapū and iwi were actively engaged in flood response and recovery efforts, and helped to house people displaced by the flood temporarily (Unknown Author, 2017h).

In October 2017, the regional council announced its amendments to the RPS based on submissions. Emphasis was placed on Māori relationships with water and addressing degradation (Bay of Plenty Regional Council, 2017). However, two organisations – Federated Farmers (the country's largest and most influential farming lobby group) and Trustpower (a private energy company that operates the Matahina Dam) – appealed the RPS to the Environment Court. The appeals centred on three provisions: the requirement to remove structural adaptations that impede people's abilities to access waterways for cultural and recreational purposes; the restoration and enhancement of waterways to provide habitat for tuna (freshwater eels); and the improvement of water quality. As a consequence of court mediation between the council and appellants, the wording of the policy became more generalised (for instance river restoration became an optional rather than compulsory action). The amended RPS came into effect in July 2018. Notably, decision-makers continue to separate river management from flood risk management. The rebuilding of the levees along the Rangitāiki River and removal of riparian vegetation (see Fig. 12), an important habitat for eels, contradicts the intentions of both the Forum River Document and the RPS.

7. Discussion

The Rangitāiki is an artefact of settler colonial intervention in, and remodelling of the biophysical environment. The history of flood management highlights how path dependency is not simply a case of an institution being ‘locked-in’ to past decisions. Rather, the continuity of institutional arrangements is a consequence of the ongoing mobilisation by those actors and groups who benefit from the institution and who seek to safeguard their advantages (Mahoney and Thelen, 2009; Wilson, 2014). The management and regulation of floods in the Rangitāiki Plains (and the wider human–environment relationships) created, protected, and redistributed resource and property rights (and values), between agricultural properties and residential areas, and between social groups. Agricultural property in the district was, and is, of high financial value, but that value is dependent on the myriad supports from local and central government, including the provision of drainage and flood risk management infrastructure. Thus, while governments are regularly subject to revision and incremental changes, the institutional arrangements for managing flood risk in the Rangitāiki Plains remained largely static throughout the twentieth and early twenty-first centuries (despite the advent of successive acts since the 1920s that strengthen the abilities of local governments to use spatial planning to restrict development in high flood risk areas).

Decisions to drain the Rangitāiki wetlands, re-align the rivers, and establish hard flood controls were all based on particular knowledge and subjectivities that perceived the unmodified (pre-colonial) floodplains as unproductive, hazardous, and undesirable spaces (Park, 2002). The formation of pathways involved agreement by authority-holders (Pākehā-led institutions and individuals) about the nature of the problem and how to solve it. In the Rangitāiki Plains, individual actors (Pākehā, farmers) and local institutions (councils) devoted considerable time and resources to the construction and maintenance of drainage and flood controls and emphasised the need to maintain



Fig. 11. Features of path dependency evident in 2017 flood event and inquiry.

investment (both financial and political) even when there was evidence of increasing flood vulnerability.

Self-reinforcing mechanisms maintained the path dependency, while learning effects led decision-makers to create (or interpret) policies and adopt strategies that followed the already chosen path. The governance and management of rivers, and the interconnected management of flood risk, continues to privilege certain types of 'experts' (engineers) and their associated knowledge and strategies. Indeed, the

dominant narrative in the Rangitāiki Plains continues to be one of improvement through technological interventions, underpinned by beliefs in humans' abilities to command and control nature. This mentality persists despite the wealth of research highlighting the problems created by (hydraulic) techno-managerial approaches to rivers, and the need for alternative approaches (Cook, 2016; O'Gorman, 2012; van Staveren and van Tatenhove, 2016).

Decisions taken by governments reflected the dominance of Pākehā



Fig. 12. Photograph of a levee in Edgumbe rebuilt following the April 2017 flood.
Source: Author's own.

values. As demonstrated in Section 5, this dominant narrative positioned the structural interventions to transform landscapes and water-scapes to facilitate Pākehā settlement based on their values. Such stories of improvement functioned to legitimise the continued presence of Pākehā and to delegitimise Māori claims. These settler narratives are mobilised to justify future actions. The constant state of construction since colonisation is central to the path dependency (of stability of the engineered settler colonial order of things).

The privileging of science, a reflection of Pākehā values, is most recently evident in the decision to appoint two engineers and one former parliamentarian to the inquiry committee for the 2017 flood. The rendering technical of flooding, in addition to being clear evidence of learning effects (with institutions emphasising engineering knowledge and skills), served to justify decisions to continue to invest in costly structural interventions. The history of ongoing structural adjustments highlights how the desire to return to the status quo, even if it means high levels of risk, is not merely a matter of cognitive dissonance but is a product of path dependent and maladaptive pathways. However, change can occur incrementally (rather than radically) as a result of shifts in the balance of political power and policy changes.

Recent efforts by iwi in the Rangitāiki Plains to reassert Māori rights, facilitated by legal mechanisms (Treaty settlements and resulting legislation) and new institutional arrangements (the Rangitāiki River Forum) hold the potential to produce new priorities and approaches to managing rivers and flood risk. Such arrangements already exist in Aotearoa New Zealand; for example, new institutional arrangements to co-govern the Waikato and Waipā Rivers (located in the central North Island) are allowing for Māori values and mana to be recognised and provided for (Te Aho, 2010). Unlike in the Rangitāiki Plains, the legislation establishing co-governance in relation to the Waikato and Waipā Rivers requires the government to engage iwi in ongoing processes of co-design and coproduction of new policies and management approaches that draw on both Mātauranga Māori (Māori Indigenous knowledge) and western scientific knowledge. This includes river restoration efforts and climate adaptation planning (Morgan and Te Aho, 2013; Parsons et al., 2017; Te Aho, 2015).

In the South Island, Ngāi Tahu iwi representatives, through collaborative decision-making processes, are carving out spaces for their relational ethics to be discussed and enacted in new policy and approaches to manage the Hurunui River. From a Ngāi Tahu perspective, paralleling those of Ngāti Awa, Ngāti Manawa, Ngāti Whare and other iwi connected to the Rangitāiki, “past, present and future life is inherently linked to humans’ responsibilities towards and care for the river, and the river’s function as part of human health both physically and spirituality” (Thomas, 2015, p. 982). The inclusion of Māori (and other marginalised groups’) perspectives, knowledge, and social values within the institutions involved in flood risk management, we suggest, offers the potential to disrupt and potentially break path dependency and adopt more sustainable and equitable future adaptation pathways. The research demonstrates that Māori temporal understandings (encapsulated in the common Māori saying the ‘past is always in front of us’) challenge Pākehā future-orientation and the narratives of persistent improvement and command-and-control.

8. Conclusion

Flood risk management, and river management more broadly, in the Rangitāiki Plains continues to prioritise Western scientific understandings of the human–environmental relationships and privilege Pākehā values. Judicial and legislative structures continue to be underpinned by Pākehā values and, in the Whakatāne District, colonial representations of the Rangitāiki Plains as an economic resource to the used, developed and improved remains dominant in shaping environmental policies and strategies. Indeed, the failure to challenge the dominant institutions, knowledge systems, discursive tools, and privileging of certain values allows for the continuation of colonial power

relations, and serves to render the people who understand the world differently silent (Thomas, 2015).

By tracing the genealogy (its discursive and material) emergence of path dependency within a single flood risk management regime, we have highlighted how the management of flooding is a layering process wherein individual decisions and actions accumulate over time. This explains why institutions remained wedded to the use of hard adaptations, despite substantive critiques by Māori communities for generations, and by non-Māori ecologists and scholars more recently (Clarkson et al., 2013; Makey and Awatere, 2018). Furthermore, this explains how successive generations of Pākehā actors mobilised to first establish and then maintain the dominant approach to flood management based on shared sets of values and beliefs about the environment and what constitutes appropriate use of environmental resources.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.gloenvcha.2019.03.008>.

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